

## Claims

[c1] What is claimed is:

- 1.A method for forming a deep trench capacitor buried plate comprising:
  - providing a substrate having a pad oxide layer and a pad nitride layer thereon, the pad oxide layer and the pad nitride layer having at least an opening;
  - performing a dry etching process for forming a deep trench in the substrate via the opening;
  - depositing a doped silicate glass film on an inner wall of the deep trench;
  - filling a sacrificial layer into the deep trench;
  - etching back the sacrificial layer for exposing parts of the doped silicate glass film;
  - removing the exposed doped silicate glass film;
  - removing the remaining sacrificial layer;
  - depositing a silicon nitride layer on the inner wall of the deep trench;
  - performing a thermal process for forming a doped region at a bottom of the trench;
  - removing the silicon nitride layer; and
  - removing the doped silicate glass film;
- wherein the silicon nitride layer serves as a barrier layer

for preventing ions of the doped silicate glass film from diffusing into a collar region of the deep trench.

- [c2] 2.The method of claim 1 wherein the doped silicate glass film is an arsenic silicate glass (ASG) film.
- [c3] 3.The method of claim 2 wherein the arsenic silicate glass film is formed by a chemical vapor deposition (CVD) process.
- [c4] 4.The method of claim 1 wherein the silicon nitride layer is formed by a chemical vapor deposition process.
- [c5] 5.The method of claim 1 wherein the doped silicate glass film is removed by an anisotropic etching process.
- [c6] 6.The method of claim 1 wherein the silicon nitride layer is removed by an anisotropic etching process.
- [c7] 7.A method for forming a deep trench capacitor buried plate comprising:
  - providing a substrate having a pad oxide layer and a pad nitride layer thereon, the pad oxide layer and the pad nitride layer having at least an opening;
  - performing a dry etching process for forming a deep trench in the substrate via the opening;
  - depositing a doped silicate glass film on an inner wall of the deep trench;

filling a sacrificial layer into the deep trench;  
removing a portion of the sacrificial layer for exposing  
parts of the doped silicate glass film;  
performing an etching process to remove the exposed  
doped silicate glass film and a portion of the pad nitride  
layer for forming a recess;  
removing the remaining sacrificial layer;  
depositing a silicon nitride layer on the inner wall of the  
deep trench;  
performing a diffusing process for forming a doped re-  
gion at a bottom of the trench;  
removing the silicon nitride layer; and  
removing the doped silicate glass film;  
wherein the silicon nitride layer serves as a barrier layer  
for preventing ions of the doped silicate glass film from  
diffusing into a collar region of the deep trench.

- [c8] 8.The method of claim 7 wherein the doped silicate glass film is an arsenic silicate glass (ASG) film.
- [c9] 9.The method of claim 8 wherein the arsenic silicate glass film is formed by a chemical vapor deposition (CVD) process.
- [c10] 10.The method of claim 7 wherein the silicon nitride layer is formed by a chemical vapor deposition process.

- [c11] 11.The method of claim 7 wherein the etching process is an anisotropic etching process.
- [c12] 12.The method of claim 7 wherein the silicon nitride layer is removed by an anisotropic etching process.